PLUS Search Results for S/N 10784809 Searched Jan 25, 2007. The Patent Linguistic Utility System (PLUS) is a USPTO automated search system for U.S. Patents from 1971 to present. PLUS is a query-by-example search system which produces a list of patents that are most closely related linguistically to the application searched. This search was prepared by the staff of the Scientific and Technical Information Center, SIRA.

4803564
5455686
5710638
5798843
5978643
6026194
6098151
6339670
4247195
5416611
5303006
5319706
5566004
5589914
5684864
5751890
5923486
5940830
6147339
6248426
5802210
4790025
5917543
5969727
4776025
5021887
5690406
4472638
4475131
4481534
4507685
4562459
4566005
4573076
4774581

4788685
4795904
4797106
4803475
4819078
4827509
4829379
4831446
4833542
4839729
4841370
4853789
4864414
4881127
4882702

EAST:
4803564 (USPAT)
5455686 (USPAT)
5710638 (USPAT)
5798843 (USPAT)
5978643 (USPAT)
6026194 (USPAT)
6098151 (USPAT)
6339670 (USPAT)
4247195 (USPAT)
5416611 (USPAT)
5303006 (USPAT)
5319706 (USPAT)
5566004 (USPAT)
5589914 (USPAT)
5684864 (USPAT)
5751890 (USPAT)
5923486 (USPAT)
5940830 (USPAT)
6147339 (USPAT)
6248426 (USPAT)
5802210 (USPAT)
4790025 (USPAT)
5917543 (USPAT)
5969727 (USPAT)
4776025 (USPAT)
5021887 (USPAT)
5690406 (USPAT)
4472638 (USPAT)
4475131 (USPAT)
4481534 (USPAT)
4507685 (USPAT)
4562459 (USPAT)
4566005 (USPAT)
4573076 (USPAT)
4774581 (USPAT)
4788685 (USPAT)
4795904 (USPAT)
4797106 (USPAT)
4803475 (USPAT)
4819078 (USPAT)
4827509 (USPAT)
4829379 (USPAT)
4831446 (USPAT)
4833542 (USPAT)
4839729 (USPAT)
4841370 (USPAT)
4853789 (USPAT)
4864414 (USPAT)
4881127 (USPAT)

4882702 (USPAT)
##

4803564	74
5455686	74
5710638	74
5798843	74
5978643	74
6026194	74
6098151	74
6339670	74
4247195	65
5416611	65
5303006	65
5319706	65
5566004	65
5589914	65
5684864	65
5751890	65
5923486	65
5940830	65
6147339	65
6248426	65
5802210	65
4790025	65
5917543	65
5969727	65
4776025	65

5021887	65
5690406	65
4472638	65
4475131	65
4481534	65
4507685	65
4562459	65
4566005	65
4573076	65
4774581	65
4788685	65
4795904	65
4797106	65
4803475	65
4819078	65
4827509	65
4829379	65
4831446	65
4833542	65
4839729	65
4841370	65
4853789	65
4864414	65
4881127	65
4882702	65

Most frequently occurring classifications of patents returned from a search of 10784809 on Jan 25 , 2007

Original Classifications

3	358/404

Cross-Reference Classifications

2	358/497
2	D18/36
2	358/296
2	358/468
2	358/444
2	386/80
2	250/208.1
2	348/251
2	348/356

Combined Classifications

3	358/497
3	358/404
3	250/208.1
3	348/251
2	434/408
2	D18/36
2	358/296
2	358/468
2	358/444
2	382/232
2	382/235
2	386/79
2	386/80
2	358/474
2	360/60
2	345/536
2	348/241
2	348/356

Titles of most frequently occurring classifications of patents returned from a search of 10784809 on Jan 25, 2007

3 **358/497** (1 OR, 2 XR)
Class 358 FACSIMILE AND STATIC PRESENTATION PROCESSING
358/400 .FACSIMILE
358/471 ..Picture signal generator
358/474 ...Scanning
358/494 ....Linear scanning pattern
358/497 .....Scanning element moves relative to a flat stationary document

3 **358/404** (3 OR, 0 XR)
Class 358 FACSIMILE AND STATIC PRESENTATION PROCESSING
358/400 .FACSIMILE
358/404 ..Facsimile memory monitoring

3 **250/208.1** (1 OR, 2 XR)
Class 250 RADIANT ENERGY
250/200 .PHOTOCELLS; CIRCUITS AND APPARATUS
250/206 ..Photocell controlled circuit
250/208.1 ...Plural photosensitive image detecting element arrays

3 **348/251** (1 OR, 2 XR)
Class 348 TELEVISION
348/207.99 .CAMERA, SYSTEM AND DETAIL
348/222.1 ..Combined image signal generator and general image signal processing
348/241 ...Including noise or undesired signal reduction
348/251 ....Shading or black spot correction

2 **434/408** (1 OR, 1 XR)
Class 434 EDUCATION AND DEMONSTRATION
434/365 .MEANS FOR DEMONSTRATING APPARATUS, PRODUCT, OR SURFACE CONFIGURATION, OR FOR DISPLAYING EDUCATION MATERIAL OR STUDENT'S WORK
434/408 ..Chalkboard or equivalent means having easily erasable surface

2 **D18/36** (0 OR, 2 XR)
Class D18 PRINTING AND OFFICE MACHINERY
D18/36 .COPY REPRODUCING EQUIPMENT

2 **358/296** (0 OR, 2 XR)
Class 358 FACSIMILE AND STATIC PRESENTATION PROCESSING
358/400 .FACSIMILE
358/296 ..Recording apparatus

2 **358/468** (0 OR, 2 XR)
Class 358 FACSIMILE AND STATIC PRESENTATION PROCESSING
358/400 .FACSIMILE
358/443 ..Specific signal processing circuitry
358/468 ...Facsimile control unit

2 **358/444** (0 OR, 2 XR)
Class 358 FACSIMILE AND STATIC PRESENTATION PROCESSING
358/400 .FACSIMILE
358/443 ..Specific signal processing circuitry

358/444 ...Memory interface

2 **382/232** (1 OR, 1 XR)
Class 382 IMAGE ANALYSIS
382/232 .IMAGE COMPRESSION OR CODING

2 **382/235** (1 OR, 1 XR)
Class 382 IMAGE ANALYSIS
382/232 .IMAGE COMPRESSION OR CODING
382/235 ..Substantial processing of image in compressed form

2 **386/79** (1 OR, 1 XR)
Class 386 TELEVISION SIGNAL PROCESSING FOR DYNAMIC RECORDING OR REPRODUCING
386/46 .PROCESSING OF TELEVISION SIGNAL FOR DYNAMIC RECORDING OR REPRODUCING
386/68 ..Fast, slow, or stop reproducing
386/78 ...Locus or track control
386/79 ....Using control signal on the recording medium

2 **386/80** (0 OR, 2 XR)
Class 386 TELEVISION SIGNAL PROCESSING FOR DYNAMIC RECORDING OR REPRODUCING
386/46 .PROCESSING OF TELEVISION SIGNAL FOR DYNAMIC RECORDING OR REPRODUCING
386/68 ..Fast, slow, or stop reproducing
386/80 ...Automatic control of the speed of the medium

2 **358/474** (1 OR, 1 XR)
Class 358 FACSIMILE AND STATIC PRESENTATION PROCESSING
358/400 .FACSIMILE
358/471 ..Picture signal generator
358/474 ...Scanning

2 **360/60** (1 OR, 1 XR)
Class 360 DYNAMIC MAGNETIC INFORMATION STORAGE OR RETRIEVAL
360/55 .GENERAL RECORDING OR REPRODUCING
360/60 ..Recording-or erasing-prevention

2 **345/536** (1 OR, 1 XR)
Class 345 COMPUTER GRAPHICS PROCESSING AND SELECTIVE VISUAL DISPLAY SYSTEMS
345/530 .COMPUTER GRAPHICS DISPLAY MEMORY SYSTEM
345/536 ..Plural storage devices

2 **348/241** (1 OR, 1 XR)
Class 348 TELEVISION
348/207.99 .CAMERA, SYSTEM AND DETAIL
348/222.1 ..Combined image signal generator and general image signal processing
348/241 ...Including noise or undesired signal reduction

2 **348/356** (0 OR, 2 XR)
Class 348 TELEVISION
348/207.99 .CAMERA, SYSTEM AND DETAIL
348/335 ..Optics

348/345	...Focus control
348/349	....Using image signal
348/354	.....By analyzing high frequency component
348/356	......Detection of peak or slope of image signal

(4803564

5455686

5710638

5798843

5978643

6026194

6098151

6339670

4247195

5416611

5303006

5319706

5566004

5589914

5684864

5751890

5923486

5940830

6147339

6248426

5802210

4790025

5917543

5969727

4776025

5021887

5690406

4472638

4475131

4481534

4507685

4562459

4566005

4573076

4774581

4788685

4795904

4797106

4803475

4819078

4827509

4829379

4831446

4833542

4839729

4841370

4853789

4864414

4881127

4882702

).pn.

(4803564 5455686 5710638 5798843 5978643 6026194 6098151 6339670 4247195 5416611 5303006 5319706 5566004 5589914 5684864 5751890 5923486 5940830 6147339 6248426 5802210 4790025 5917543 5969727 4776025 5021887 5690406 4472638 4475131 4481534 4507685 4562459 4566005 4573076 4774581 4788685 4795904 4797106 4803475 4819078 4827509 4829379 4831446 4833542 4839729 4841370 4853789 4864414 4881127 4882702).pn.

above 3

abstract 1

accompanying 1

accordance 2

according 6

addition 2

amount 6

and 20

another 1

apparatus 7

apparent 1

appearance 1

are 3

aspect 2

attain 1

background 1

because 1

been 2

being 2

binary 1

bit 1

black 1

block 5

box 1

brief 1

can 1

cannot 1

capacity 1

case 4

causes 1

causing 1

cfoi 6

coding 3

color 6

compressed 2

compresses 1

compressing 2

compression 7

configuration 1

connected 1

consequently 1

consumption 1

control 16

copy 6

copying 3

data 17

decided 1

depressed 4

described 4

description 3

from 6

further 2

gray 1

hand 2

has 4

hereinafter 1

high 7

however 1

iii 1

image 53

images 2

includes 3

increase 1

initial 1

input 9

inputted 4

inputting 1

interface 1

invention 13

jpeg 2

judging 1

length 4

levels 1

lost 1

machine 3

made 1

make 1

manager 1

means 6

memory 17

method 7

mode 10

not 3

object 2

objects 1

often 1

once 1

one 1

only 1

operation 3

order 3

other 3

output 15

outputs 1

outputting 3

overall 2

packet 1

page 7

per 2

perform 3

performed 4

performing 2

performs 2

pixel 1

point 1

popup 1

possible 2

predetermined 6

preferred 1

present 7

printer 7

printing 3

problems 1

procedure 1

processing 8

proposed 1

provided 2

quality 1

rate 1

read 3

reading 1

recent 1

reduce 1

reference 1

referred 1

relates 1

required 1

result 1

scanner 7

scanning 1

screen 4

sending 1

sequence 1

serving 3

setting 4

showing 16

showlng 1

shown 5

since 2

small 1

software 1

solve 1

speed 6

start 4

starting 1

state 1

step 6

storage 5

store 2

stored 14

stores 1

storing 7

structure 7

such 3

summary 1

system 2

tab 2

technique 1

the 70

thememory 1

thepresent 1

there 3

therefore 1

thereof 1

this 5

time 3

timing 1

title 1

uncompressed 3

unfixed 1

unit 11

until 2

used 1

user 1

uses 1

using 1

variable 2

when 7

whether 1

which 13

while 2

white 1

will 2

window 1

with 7

years 1

http://ieeexplore.ieee.org/iel2/808/2325/00064034.pdf?arnumber=64034

THE ISO/CCITT STANDARD FOR CONTINUOUS-TONE IMAGE COMPRESSION

Gregory K. Wallace
Digital Equipment Corporation
Littleton, MA 01460

ABSTRACT

The Joint Photographic Experts Group is an ISO/ CCITT working group in the process of developing an international standard for general-purpose, continoustone, still-image compression. A brief history is presented as background to a summary of the past year's progress, which was highlighted by definition of the overall structure of the proposed standard. This structure consists of a Baseline System, a simple coding method sufficient for many applications, a set of Extended System capabilities, which extend the Baseline System to satisfy a broader range of applications, and an Independent Lossless method for applications needing that type of compression only.

1. INTRODUCTION

The Joint Photographic Experts Group (JPEG) is a working group of technical experts in image coding. The goal of JPEG is to develop an international standard for compression of still-frame, continuous-tone (gray-scale or color) images. The aim of the standard algorithm is to be general-purpose in scope, i.e., to support as wide a variety of image communication services and image-based computer applications as is feasible for a single standard.

JPEG reports jointly to both the ISO group responsible for Coded Representation of Picture and Audio Information (ISO/IEC JTCl/SC2/WG8) and to the CCITT Special Rapporteur group for Common Components for Image Communication (a subgroup of CCITT SGVIII). This dual reporting structure is intended to ensure that ISO and CCITT produce compatible image compression standards.

This paper is a progress report on the JPEG standardization effort, and is intended as an update to the set of papers presented here last year [1-3]. Note: the structure of the algorithm and its various modes of operation as described in this paper must be regarded as work in progress toward a draft standard.

The material presented here reflects the committee's consensus up through the July 1989 meeting, but this material is subject to change during the remainder of

duced the best picture quality. Since then, a group-wide effort to refine, test, and document the DCT-based algorithm, in all of its modes of operation, has been underway. The background summarized in this section is described in much greater detail in [1-3].

3. ALGORITHM STRUCTURE OVERVIEW

The proposed JPEG algorithm structure is comprised of three main parts: (1) a Baseline System, (2) a set of optional Extended System capabilities, and (3) an Independent Lossless coding capability.

Baseline System is the name given to the simplest image coding/decoding capability proposed for the JPEG standard. It consists of techniques well-known to the Image Coding community, including 8x8 DCT, uniform quantization, and Huffman coding. Together these provide a non-lossless, high-compression image coding capability, which preserves image fidelity at compression rates competitive with or superior to any techniques, regardless of their complexity, known to JPEG committee members. The Baseline System provides "sequential build-up" only, which means that an encoded image is transmitted as a single pass, and pixels are reconstructed at the decoder in essentially raster-scan order.

Extended System is the name given to a set of additional capabilities not provided by the Baseline System. These optional capabilities may be implemented singly or in combination. Included among these are Arithmetic coding, "progressive build-up," and "progressive lossless" coding.

Arithmetic coding is an optional, "modern" alternative to Huffman coding. Because the Arithmetic coding method chosen adapts to image statistics as it encodes, it generally provides 5-10% better compression than the Huffman method chosen by JPEG. This benefit is balanced by some increase in complexity (though some experts debate this, depending on the definition of complexity), and the relative newness of the technique means that fewer parties worldwide have experience with practical implementations.

Progressive build-up, the alternative to sequential build-up, is a way of re-ordering the coded data prior to transmission, so that a rough approximation of the image will appear at the receiver first, followed by successively more detailed versions of the final image. This mode is useful for human interaction with picture databases over low-bandwidth channels.

Progressive lossless refers to a lossless (also called "reversible" or "exact") compression method which operates in conjunction with progressive build-up. In this mode of operation, the final stage of progressive build-up results in a received image which is bit-for-bit identical to the original.

This proposed algorithm structure also includes the requirement that the Baseline System be contained within every JPEG-standard codec which utilizes any of the Extended System capabilities. In this way, the Baseline System can serve as a default communications mode for services which allow encoders and decoders to negotiate. In such cases, image communicability between any JPEG sender and receiver which are not equipped with a common set of Extended System capabilities is assured. Redundancy of implementation is low, because any codec which incorporates an Extended System capability needs all (or almost all) of the Baseline System components as a functional subset.

The third part of the proposed algorithm structure is the Independent Lossless coding capability, a simple, DPCM-based, stand-alone method of lossless compression. An Independent Lossless codec is not compatible with Baseline or Extended Systems, in the sense of having data interchange capability with either. (It does, however, use part of the same algorithm used in the Extended System's progressive buildup capability).

The Independent Lossless capability has been proposed by JPEG, in addition to the Extended System's progressive lossless option, for the following reasons. Progressive lossless operates as a final pass added on to one or more DCT-based, non-lossless progressive passes. The DCT, plus the required buffers and control logic needed in a progressive lossless implementation, are relatively complex in comparison with the DPCM-based Independent Lossless algorithm. Applications which require lossless coding only, with no need for any non-lossless capability, are likely to find the progressive lossless method burdensome.

4. BASELINE SYSTEM

The Baseline System provides non-lossless compression with sequential build-up. It can accommodate pixels with 8 bits/color-component or less, with the Extended System handling higher precision pixels.

It operates by dividing an image into 8x8 pixel blocks, and transforming each by the 8x8 DCT to produce 64 output numbers or "coefficients." Each coefficient is then independently quantized by a uniform quantizer with step-size determined by a corresponding "visibility threshold" from a 64-element

quantization matrix. Of these 64 quantized values, the zero-frequency or "DC" coefficient is encoded differentially from the previous block's DC term. The 63 "AC" coefficients are not differentially encoded. The quantized coefficients are then Huffman encoded to reduce statistical redundancy.

The Baseline System specifies *default* Huffman tables and quantization matrices, the latter based on CCIR-601 color images, a digital TV standard which uses a variant of the YUV color space [4]. There are two default matrices, one for Y and one for both U and V. There are two sets of default Huffman tables, with one DC and one AC table per set.

Baseline System decoders are required to store the default tables and matrices, because when used, they are not transmitted as part of the coded data stream. Because the encoder may opt to use *custom* tables or matrices instead, in which case these *are* transmitted as part of the coded data stream, Baseline System decoders must also be able to receive and utilize whatever is transmitted.

From these decoder requirements, it follows that a Baseline System encoder may operate in any of the following modes: (1) one-pass encoding, using default Huffman tables, (2) one-pass encoding, using custom Huffman tables pre-defined for some class of images, or (3) two-pass encoding, with the encoder creating, during the first pass, custom Huffman tables specific to the image being encoded.

Though the default matrices and tables suggest a certain class of images, the Baseline System is a general purpose algorithm, able to encode images in any color space and with any pixel dimensions. (At press time, the possibility of eliminating default quantization matrices was under consideration within JPEG). Images represented in color spaces like YUV, which separate the chromatic from the achromatic information, generally will compress better than those like RGB, which do not, but the JPEG algorithm can be applied to either class of color space.

A Baseline System encoder may optionally insert various types of "marker" codes within the encoded image, with placements restricted to 8x8 block boundaries. One type of marker code is provided for resynchronization purposes, for uses such as partial protection against transmission or storage bit errors. These codes are uniquely identifiable without synchronization to the Huffman data stream. Because any encoder may opt to insert these codes, and because DC-term encoding is reset for blocks following these codes, every Baseline System decoder must be designed to detect them and reset its DC decoding process accordingly.

5. EXTENDED SYSTEM CAPABILITIES

An Extended System includes all of the Baseline System, and then adds to it one or more of the capabilities described in this section.

Additionally, as for the Baseline System, resynchronization markers may be used in conjunction with any of the Extended System capabilities. These codes are the same for both Arithmetic and Huffman coding. Also, pixels of greater than 8 bits precision per color-component may be used with any of the Extended System capabilities.

5.1 Entropy Coding Options

"Entropy coding" is the functional component of the compression system which compacts the data by reducing statistical redundancy. Either Arithmetic or Huffman coding may be used as the entropy coding method for a JPEG Extended System implementation. Both coding methods have been designed by the committee so that transcoding from one to the other may be implemented straightforwardly.

A. Arithmetic Coding

Arithmetic coding investigations in recent years have resulted in a class of practical entropy coding algorithms which are relatively new with respect to the long-established Huffman coding techniques. Any of the Extended System capabilities described below may be used in conjunction with either Arithmetic or Huffman coding. Also, an Extended System codec may be formed by using the Baseline System components, but with Arithmetic coding used rather than Huffman. An excellent collection of papers on recent Arithmetic coding developments is contained in [5].

B. Extended Huffman Coding

Huffman coding used in conjunction with any of the Extended System capabilities described below is referred to as "Extended" Huffman coding, to distinguish it from the specific set of Huffman codes used in the Baseline System. However, the Baseline Huffman codes form a subset of the Extended Huffman codes, which are only slight larger than the subset.

5.2 Progressive Build-up

The operation of an Extended System with progressive build-up is in many ways similar to that of a Baseline System. The difference begins after quantization of the DCT coefficients, at which point the

quantized coefficients are stored in an image buffer, rather than being entropy encoded and transmitted immediately. After initial quantization and storage, the encoder makes two or more passes through the image, encoding only a portion of each 8x8 block's quantized coefficient data during each pass.

The following features are non-overlapping characteristics of progressive build-up, which may be used together or in combination. (At press time, JPEG was still considering whether to require that progressive build-up decoders be able to handle all these features).

A. Successive Approximation

This method encodes increasingly-refined image detail, by encoding (potentially) all DCT coefficients within each 8x8 block to successively greater accuracy during each pass of the build-up.

B. Spectral Selection

This method encodes increasingly-refined image detail, by encoding different groups of DCT coefficients with each 8x8 block during each pass of the build-up. Spectral selection and successive approximation are quite complementary modes of progressive build-up, and for many applications may be effectively used in conjunction with one another.

C. AC Prediction

This technique predicts low-frequency AC terms from nine (quantized) DC terms: the one from the current block plus the eight surrounding blocks. This method results in improved quality, particularly of low bit-rate stages during the progressive buildup.

D. 2-D DC Prediction

With two-dimensional (2-D) DC prediction, the previous block's DC term, plus the DC term of the block above, are used to formulate the prediction of the current DC value to be differentially encoded. This results in a "lossless" encoding of the *quantized* DC terms. This lossless 2D predictor is also used for Independent Lossless coding.

5.3 Progressive Lossless

This feature provides reversible compression by sending a difference image, the per-pixel difference between the non-reversible and the original images, as a final "stage" of encoded data. This feature requires that the encoder contain an inverse DCT and an inverse quantizer. JPEG may revise this method to a "near-lossless" capability, because unless JPEG specifies that the inverse DCT implementations in both the transmitter and receiver must be *identical*, pixels in the reconstructed image will occasionally differ from the original by one pixel level. This is a result of inevitable rounding differences resulting from the finite arithmetic of non-identical implementations. At press time, this matter was still under consideration by JPEG.

5.4 Hierarchical Progressive Build-up

This feature provides a hierarchical encoding of an image, obtained via the following procedure: (1) filter and down-sample the original image by a factor of 2^N in both dimensions, (2) encode this reduced-size image either sequentially or progressively by the methods already discussed, (3) use this reduced-size image as a predction for the next (2^{N-1}) stage, (4) encode the 2^{N-1} difference image. This procedure is repeated until the final stage is reached. This capability is useful in applications where it is desirable to access a significantly reduced size version of a large image. This method is illustrated schematically in [2].

6. INDEPENDENT LOSSLESS CODING

Independent Lossless coding is a simple, DPCM-based, stand-alone method of lossless compression, provided to meet the needs of applications which lossless coding only, with no need whatsoever for much higher compression non-lossless, DCT-based methods. The algorithm is comprised of the 2-D DC predictor described above as part of the progressive build-up algorithm, but here it operates directly on pixels rather than DC coefficients. The difference between the prediction and the actual value is encoded losslessly by either Huffman or Arithmetic coding.

7. STANDARDIZATION SCHEDULE

This paper described the proposed structure of the JPEG standard, a major accomplishment of the past year's work. Several revisions of the detailed technical specification were also created in the past year. JPEG expects to finalize the remaining technical issues at its October 1989 meeting, and to release a draft technical specification of the algorithm to external coding experts before the end of 1989. An ISO Draft Proposal should be approved at the February 1990 meeting, with ISO balloting to begin in March. The final standard should be approved by early 1991.

ACKNOWLEDGEMENTS

The author would like to acknowledge the many contributions of JPEG members to the work described herein. Most of even the *primary* contributors have not been cited herein, though the references below lead to many of them. This work has been a truly global effort. Thanks also to DEC for support of this work, and special thanks to Graham Hudson and Hiroshi Yasuda for their guidance.

REFERENCES

[1] Hudson, G., et. al., "The International Standardisation of a Still Picture Compression Technique," Globecom '88.

[2] Léger, A., et. al., "Still Picture Compression Algorithms Evaluated for International Standardization," Globecom '88.

[3] Wallace, G., et. al., "Subjective Testing Results for Still Picture Compression Algorithms for International Standardization," Globecom '88.

[4] CCIR Recommendation 601, "Studio Digital Television Standard," 1982.

[5] Mitchell, J.L., Pennebaker, W.P., et. al., IBM Journal of Research and Development, vol. 32, no. 6, pp. 716-795, Nov. 1988.